

Molding Composition For The Transfer of Micro-Structured Surfaces

Technical Field

The present invention relates to a composition comprising a binder and spherical inorganic matrix particles. The invention further relates to a porous shaped article obtainable from said composition, a method of making said article, a mold comprising said porous article and a device for conducting a fluid between a space and a duct or for deep-drawing or engraving of plastic films and foils.

Background Art

Recent developments in the molding technology have provided molds, in particular in the field of deep drawing, consisting of porous materials with enhanced surface properties and improved air permeability replacing formerly used molds consisting of a non-porous, solid mold into which were provided with holes through which the air is withdrawn by suction. This technique has been proven to be deficient when it comes to transferring finely structured or smooth surfaces to the molded deep-drawn article.

United States Patent 6,015,518 discloses a device comprising a coarsely porous shaped part, whose surface, at the point where the fluid flows through it, carries a finely porous surface layer and on the other surface areas fluid-impermeable closing means, which are interrupted by at least one duct connection opening. At least the coarsely porous shaped part and the finely porous surface layer are in the form of a plastic body through which passes a three-dimensional network of pores, which pass in finer, but continuous manner from the shaped part into the surface layer and to the outer surface thereof. The fluid-impermeable closing means can be constructed as pore-free closing layer for the same plastic body or can be a separate part linked by suitable means with the plastic body. The coarsely porous shaped part, the finely porous surface layer and optionally the pore-free closing layer advantageously are made from the same cured plastic, in which are

incorporated in the vicinity of the surface layer smaller particles, in the vicinity of the shaped part larger particles and in the vicinity of the closing layer no particles. The weight proportion of the particles in the surface layer and in the shaped part is higher than the weight proportion of the plastic and in the surface layer it is generally lower than in the shaped part. For the manufacture of the device various mixtures of particles and as yet uncured plastic are produced, said mixtures being superimposed in suitable molds, compacted (optionally individually) and cured together. Concerning the materials particularly suitable for the manufacture of the device according to '518 it is referred to European patent application publication 0486421. The material comprises a cured plastic, e.g. an epoxy-based plastic, in which are incorporated particles with a preferably irregular shape in such a way that the material has a continuous porosity in all directions. The particles are preferably of aluminium or an aluminium alloy, but can also be of another metal or a ceramic material.

United States Patent 5,061,427 is directed to a mold body consisting of a mechanically workable, porous material, which allows providing complicated shapes without suffering a loss of quality of the deep drawn foil. The porous mold body is made by a method comprising the steps of shaping a mixture of metallic particles and resin into a uniformly porous homogeneous, unstratified block, wherein said metallic particles are of irregular shape and the size of said metallic particles is selected such that in said mixture particles of a size through the whole particle size range of 10 μm to 450 μm are provided; curing said resin; forming a shape determining gas permeable mold face surface on the unstratified block, said surface having a plurality of pores, by mechanically machining said shape determining mold face surface to a desired shape, wherein a porosity of said mold face surface remains intact during machining; and, covering a plurality of remaining surfaces of the block to make them gas impermeable.

WO publication 95/11744 describes a distributor element having a distributor body to distribute fluids as finely as possible and with low pressure loss. The distributing body is made of a material provided with pores connected to a channel system. The channel system is formed by the outer delimiting

surfaces of clusters that in turn consists of particles, and connects the inlet surface with the outlet surface of the distributing body. Distributing surfaces that distribute the fluid in the distributing body before the fluid enters and flows through the distributing body are arranged in the distributing body.

5 United States Patent 5,840,425 discloses a material, produced by forming clusters having a fine structure, each cluster comprising a plurality of particles of comparable size held together by a first binding agent and shaping said clusters into a cohesive structure with the aid of a second binding agent to fasten together a plurality of said clusters, thereby forming a coarser
10 structured material, said material containing a first system of coarser structured channels and cavities extending between the clusters or being formed by the outer envelope of the clusters and a plurality of second systems of fine structured channels and cavities extending between the particles and within the clusters, said first coarse structured channel system and said
15 second fine structured systems of channels being interconnected. According to the disclosure of the '425 patent the metal powder must have particles with a very irregular shape. The particle size is disclosed to be between 50 μm and 100 μm . Cluster formation takes place by a kneading and rubbing process, such as is carried out by bakers with dough. The disclosed material can be
20 used for producing shaped articles, models, filters, distributors for distributing gases or liquids, mixers for mixing gases and/or liquids, storing means, fire/noise protection coverings, etc.

The state of the art porous articles consisting of a granular material and a plastic binder material suffer from the drawback that the pores clog along the
25 surface where it is cut due to the smudging of the binder of the plastic material, and small particles of material from the art surface disintegrate resulting in a surface which is no longer perfectly smooth.

Summary of the Invention

It has been a first object of the present invention to provide a composition
30 which can be formed into any shape resulting in a shaped porous article.

It has been a second object of the present invention to provide a shaped